

We Claim

1. Apparatus for pressure saturation of a liquid with a gas comprising
 - 5 - a gas-containing pressure saturation vessel (1),
 - one or more nozzles (8) disposed to inject liquid into the pressure saturation vessel (1) at the top of the pressure saturation vessel (1)
 - one or more tubes (4) open at the top and closed at the bottom disposed
10 beneath said one or more nozzles (8) in the pressure saturation vessel (1), one or more of said nozzles (8) being aligned to discharge into each dissolver tube (4),
 - a liquid outlet (16) at the bottom of the pressure saturation vessel beneath the dissolver tubes (4).
- 15 2. Apparatus according to Claim 1, wherein said liquid is water.
3. Apparatus according to Claim 1 wherein said gas is air.
4. Apparatus according to Claim 1, wherein said nozzles (8) are smooth jet
20 nozzles.
5. Apparatus according to Claim 1, wherein the the nozzles (8) are configured to produce a pressure drop under operating conditions of less than 1 bar
- 25 6. Apparatus according to Claim 5, wherein said pressure drop is less than 0.5 bar.
7. Apparatus according to Claim 1, wherein the nozzles (8) are screwed into a lid (2) at the top of the pressure saturation vessel (1).
- 30 8. Apparatus according to Claim 1, wherein the nozzles (8) have gap widths greater than 4 mm at their narrowest flow cross section.

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9. Apparatus according to Claim 1, further comprising shut off elements (13) adapted to control the liquid flow rate through the individual nozzles (8) separately.
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10. Apparatus according to Claim 1, wherein said nozzles are adapted to produce a liquid jet having a velocity of more than 3 m/sec.
11. Apparatus according to Claim 10, wherein said velocity is more than 6 m/sec.
12. Apparatus according to Claim 1, wherein said apparatus is adapted to inject water into said tubes at a velocity of greater than 8 m/sec, and achieve a saturation of the water of greater than 90%.
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13. Apparatus according to Claim 12, wherein said saturation is greater than 95%.
14. Apparatus according to Claim 1, wherein each of the dissolver tubes (4) has a single nozzle associated with it.
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15. Apparatus according to Claim 15, wherein the ratio of the diameter of the dissolver tube (4) to the diameter of the associated nozzle (8) is in the range of from 3 to 8.
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16. Apparatus of Claim 15, wherein said ratio is in the range of from 3 to 5.
17. Apparatus of Claim 16, wherein said ratio is 4.
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18. Apparatus according to Claim 1, wherein each of the dissolver tubes (4) has four nozzles associated with it.
19. Apparatus according to Claim 18, wherein the ratio of the diameter of the

dissolver tube (4) to the diameter of one of said nozzles (8) is in the range of from 6 to 16.

5 20. Apparatus according to Claim 19, wherein said ratio is in the range of from 6 to 10.

21. Apparatus according to Claim 20, wherein said ratio is 8.

10 22. Apparatus according to Claim 1, wherein the distance between each of the dissolver tubes (4) and the at least one nozzle (8) associated with it is in the range of 100-400 mm.

15 23. Apparatus according to Claim 22, wherein said distance is in the range of 150 to 250 mm.

24. Apparatus according to Claim 1, adapted to provide a residence time of the liquid in the dissolver tubes (4) of less than 10 sec.

20 25. Apparatus according to Claim 24, wherein said residence time is less than 5 seconds.

26. Apparatus according to Claim 25, wherein said residence time is less than 2.5 seconds.

25 27. Apparatus according to Claim 1, wherein the liquid outlet (16) at the bottom of the gas saturation vessel (1) is dimensioned to enable an outflow velocity of the liquid from the gas saturation vessel (1) of from 50 and 150 m/h.

30 28. Apparatus according to Claim 27, wherein said velocity is from 70 to 90 m/h

29. Apparatus according to Claim 1, wherein a gas is supplied to the top of said gas saturation vessel through a gas supply line (25), and the amount of gas

supplied is adjustable by a control valve 20 to control the level (17) of the liquid in the gas saturation vessel.

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30. Apparatus according to Claim 1, further comprising a level gauge.
31. Apparatus according to Claim 30, wherein said level gauge is a vertical pipe (6) which is outside the gas saturation vessel (1) and is in communication with the vessel interior and within which a float (18) is located.
- 10 32. Apparatus according to Claim 31, wherein the float (18) is magnetically detectable.
- 15 33. Apparatus according to Claim 31, wherein the float (18) activates a minimum-maximum circuit (19) which controls the feed of gas to the pressure saturation vessel (1).
- 20 34. Apparatus according to Claim 32, wherein the float (18) activates a minimum-maximum circuit (19) which controls the feed of gas to the pressure saturation vessel (1).
35. Apparatus according to Claim 29, further comprising a pressure governor valve (21) in the gas feed line (20).
- 25 36. Apparatus for pressure saturation and pressure release of liquid for introduction into a flotation cell comprising
- a flotation cell (10),
 - a pressure saturation vessel (1) having a liquid feed line connected to the liquid outlet of the flotation cell (10),
 - 30 - one or more pressure release valves (7) disposed in liquid lines (23) between the liquid outlet (16) of the pressure saturation vessel (1) and a liquid feed line (23) to the flotation cell (10).

37. Apparatus according to Claim 36, wherein the pressure saturation vessel (1) is a pressure saturation vessel according to Claim 1.
- 5 38. Apparatus according to Claim 37, comprising a central shut-off element (22) in the liquid line (15) between the liquid outlet (16) of the pressure saturation vessel (1) and the pressure release valve (7).
- 10 39. Apparatus according to Claim 38, wherein the liquid flow rate from each pressure release valve (7) is controllable by an upstream or downstream shut-off element (24).
40. Apparatus according to Claim 39, wherein the pressure release valves consist of perforated plates (250) into which one or more nozzles (260) are screwed.
- 15 41. Apparatus according to Claim 39, wherein the pressure release valves consist of plates (210) into which hole-type or slit nozzles (220) are milled.
- 20 42. Apparatus according to Claim 36, wherein a liquid line piece (29) of a length in the range of 10 to 100 cm is situated between the pressure release valves (7) and the center of the feed tube (23) to the flotation cell.
43. Apparatus according to Claim 42, wherein said length is 10 to 30 cm.
- 25 44. Apparatus according to Claim 36, wherein the pressure release valves (7) have gap widths greater than 4 mm at their narrowest flow cross section.